WHAT IS CLAIMED IS:

1. A rotary variable-volume machine comprising;

(a) at least one piston element:

(b) a piston mechanism configured to move said piston element in a motion that is simultaneous orbital motion about a primary axis and rotation about a secondary axis that passes through said piston element, such that said piston element sweeps out an annular path of variable cross-section;

(c) a stator housing containing a modified toroidal operational volume, said modified toroidal operational volume defined by said annular path, such that the side piston element moves through said modified toroidal operational volume, said piston element contacting walls of said modified toroidal operational volume;

(d) at least one inlet opening through said stator housing into said modified toroidal operational volume; and

(e) at least one outlet opening through said stator housing from said modified toroidal operational volume.

2. The machine of claim 1, wherein said piston mechanism includes:

(e) a main shaft deployed in said stator housing, said main shaft configured so as to rotate about said primary axis; and

(f) at least one rotor mechanically linked to said main shaft so as to rotate about said primary axis of rotation, said rotor being at least partially deployed within said modified toroidal operational volume, said at least one piston element being deployed on said rotor.

3. The machine of claim 2, wherein said at least one piston element is implemented as at least one pair of piston elements deployed on said rotor, said piston elements having at least a region with a thickness substantially equal to the thickness of said rotor, and each one of said pair of said piston elements is deployed opposite another one of said pair at 180° and lies in a plane that is at 90° to a plane of another one of said pair, and at any point of rotation where any one of said piston elements lies within a cross-section of said rotor, a surface area of said stator housing contacts said rotor thereby creating a seal area.

4. The machine of claim 3, wherein said at least one inlet opening is configured proximally to said seal area in a direction of rotation, and said at least one outlet opening is configured distal to said seal area in a direction of rotation.

5. The machine of claim 4, wherein a ratio of piston rotation to rotor rotation is 1:2, therefore said at one inlet, said at least one outlet and said seal area is implemented as one inlet, one outlet and one seal area.

6. The machine of claim 4, wherein said secondary axis of rotation is perpendicular to said primary axis.

7. The machine of claim 6, wherein said rotor is implemented as a disc deployed on, and perpendicular to, said main shaft and at least partially deployed within said modified toroidal operational volume, said secondary axis lying in said rotor.

8. The machine of claim 7, wherein each of said pair of piston elements is attached to opposite ends of a rotatable axel lying on said secondary axis, rotation of said axel affected by interaction between a first gear affixed to said axel and second gear statically affixed to said stator housing, such that rotation of said main shaft causes rotation of said axel.

9. The machine of claim 8, wherein each said piston element is implemented substantially as a disc.

10. The machine of claim 4, wherein said secondary axis of rotation is implemented as at least a second and a third axes of rotation, both of which are parallel to said primary axis, such that each one of said pair of piston elements rotates about a corresponding one of said second and third axes of rotation.

11. The machine of claim 10, wherein said stator housing includes an inner and an outer stator element.

12. The machine of claim 11, wherein said rotor is implemented as a cylinder deployed within said modified toroidal operational volume, said cylinder configured so as to rotate about said inner stator element and said main shaft, said second and third axes lying substantially in said rotor.

13. The machine of claim 12, wherein each one of said pair of piston elements is attached to a corresponding rotatable axel, each corresponding axel therefore lying on one of said second and third axes of rotation, rotation of said axels affected by interaction between a first gear statically affixed to said stator housing and second and third gears each affixed to corresponding ones of said second and third axels, such that rotation of said main shaft causes rotation of said axels and said rotor.

14. The machine of claim 12, wherein each said piston element is implemented with a substantially rectangular outer contour.

15. The machine of claim 1, implemented as an internal combustion engine further comprising an injector for injecting a combustible mixture into said inlet.

16. The machine of claim 15, wherein said injector is a second such machine of claim 1.